Table 1.3 Medical Technology and Spending Growth, Residual and Related Studies

Study	Study Period	Method	Findings
(Newhouse, 1992, 1993b)	Varied	Residual approach, reviewing non-technology cause of spending growth	"The principal cause of increased costs appears to be the increased capabilities of medicine."
(Schwartz, 1987)	1977–1984	Residual approach, reviewing non-technology cause of spending growth	Medical innovation and diffusion is the primary, controllable factor contributing to the underlying, upward trend in health care expenditures.
(Peden and Freeland, 1998)	1960–1993	Regression analysis using the level of insurance coverage and non-commercial research spending as proxies for technology	70% of spending growth is attributable to medical technology (much of which was induced by insurance coverage).
(Newhouse, 1981, Varied, 1988)		Regression analysis examining the change in prices as a function of the level of, and changes in, insurance coverage and gross national product (GNP)	The most important explanation of medical price inflation is that high levels of insurance coverage induced high rates of new product development and use.
(Cutler, 1995)	1940–1990	Residual approach	Technology accounts for 49% of the growth in real health care spending per capita from 1940 to 1990.
(Smith et al., 2009)	1960–2007	Residual approach (update to Newhouse's 1992 paper, with some modifications to model)	Attribute 27 to 48% of growth to spending on new technologies.
(Bundorf et al., 2009)	2001–2006	Decompose spending growth into increases in price and increases in quantity	Attributed 100% of growth in outpatient services and 72% of growth in pharmaceuticals to increases in quantity.
(Frogner, 2010)	1970–2005	Evaluate impact of growth in average health care wage on growth in spending in the US, Australia, and Canada	Growth in wages is not a significant driver of spending growth.
(Finkelstein, 2007)	1950–1990	Estimated impact of expanded health insurance on spending growth	Spread of insurance accounts for ~50% of the growth in Medicare spending.

Table 1.4 Medical Technology and Spending Growth, Affirmative Studies

Study	Study Period	Method	Findings
(Scitovsky, 1985)	1971–1981	Examined changes in treatment patterns for common illnesses at the Palo Alto Medical Clinic	Big ticket new technologies were responsible for spending growth.
(Scitovsky and McCall, 1976)	1951–1971	Examined changes in treatment patterns for common illnesses at the Palo Alto Medical Clinic	Little ticket items were responsible for spending growth.
(Showstack et al., 1982)	1972–1977	Examined changes in treatment patterns for patients hospitalized at the UCSF hospital for 1 of 10 diagnoses	Increased use was largely attributable to the use of new technologies.
(Holahan et al., 1990)	1983–1985	Used two-stage least squares regression analysis to examine changes in Medicare expenditures per enrollee in different specialties	Spending growth was greatest in specialties likely to have experienced the greatest rate of technical innovation.
(Cutler and McClellan, 1996)	1984–1991	Examined hospital adoption of, and patient receipt of, coronary revascularization technologies	The expansion of invasive cardiac surgeries accounts for almost all of the growth in treatment costs for heart attacks.
(Bradley and Kominski, 1992)	1984–1987	Decomposed Medicare inpatient costs per case into input price inflation, changes in costs with diagnostic related groups (DRGs), and changes in case mix across DRGs	Technology-related factors accounted for at least 35% of the real increase in costs per case.
(Katz et al., 1997)	1987–1992	Examined spending growth across different clinical categories	Spending growth was greatest in service categories considered more technologically expensive.

(*Continued*)

Table 1.4 (Continued)

Study	Study Period	Method	Findings
(Okunade and Murthy, 2002)	1960–1997	Used total research and development spending and health research and development spending as a proxy for technological change	"Technological change is a major escalator of health care expenditure and confirm a significant and stable long-run relationship among per capita real health care expenditure, per capita real income and broad-based R&D expenditures."
(Di Matteo, 2005)	1975–2000	Used time as a partial proxy for technological change	Technological change accounts for approximately two-thirds of the increases in real per capita health expenditures in US and Canada from 1975 to 2000.
(Mas and Seinfeld, 2008)	1982–1995	Hospitals' acquisition of technology (as a proxy for spending growth)	Increases in HMO market share reduce the adoption of technologies that are new and already at the steady-state level, thus lowering the ultimate level of technology and leading to ultimate long-term reductions in medical spending growth.

most of the diseases they studied was related to the increased use of "little ticket" technologies (i.e. technologies with a relatively low unit price) such as lab tests and X-rays. They did not attempt to identify specific changes in knowledge that led to these changes in use patterns.

A similar analysis of experience between 1964 and 1971 revealed that the little ticket technologies continued to account for observed cost increases, with one important exception: the cost of treating acute myocardial infarction (heart attack) rose